Addendum To The MODTUN & FAFNIR User's Guide
(1st draft)

Grid Editor
Grid Interpolator
PC-FLAME Final State To AXUM Format Converter
PC-FLAME Final State File Format Converter
PC-FLAME
PC-FLAME Final State To TascPost Format Converter

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Last Revision: March 2 1992

CONTRACT SERIAL NO. 23440-1-9047-01-SQ

CONTRACTOR: ATLANTIS SCIENTIFIC

"ADDENDUM TO THE MODTUN & FAFNIR USER'S GUIDE (1st draft)

14 pp

MICROMEDIA

Backups

The source-files and the command-files for all these programs are on a single 1.2MB floppy diskette. Two copies of this backup diskette were delivered on March 2, one labelled CCRL COPY #1, and the other CCRL COPY #2.

The backup was created with PKZIP. The backup for each program is in a separate directory:

Grid Editor	- \GRIDEDIT
Grid Interpolator	- \FINEGRID
PC-FLAME Final State File Format Converter	- \CFINAL
PC-FLAME to AXUM	- \AXCONV
PC-FLAME	- \FAFNIR
PC-FLAME to TascPost	- \FAF2TASC

Each directory contains several .ZIP files. Each .ZIP file reflects the state of the program on a particular date. Use the most recently dated backup. Most of the backups do not contain paths.

The backup diskette also contains:

\DOC\README.DOC	- this document
\BATCH\AXCONV.BAT	- runs the Axum Data generator
\BATCH\CFINAL.BAT	- runs PC-FLAME Final State converter
\BATCH\FAF2TNEW.BAT	- runs the TascPost data generator
\BATCH\FINEGRID.BAT	- runs the Grid Interpolator
\BATCH\GRIDEDIT.BAT	- runs the Grid Editor
\BATCH\PCFLAME.BAT	- runs PC-FLAME

Software Tools Used

NDP Fortran-386 3.2.0
NDP C-386 3.2.0 (One module of AXCONV is written entirely in C)
PharLap linker and DOS-Extender 4.0

Files and Directories

The source code and the rebuild command-files for each program reside in the appropriate subdirectory of \SRC. The executable files and the linker map files all reside in \EXE. The object files reside in the appropriate subdirectory of \OBJ.

AXCONV	- \SRC\AXCONV	\EXE\AXCONV.EXP	\OBJ\AXCONV
CFINAL	- \SRC\CFINAL	\EXE\CFINAL.EXP	\OBJ\CFINAL
FAF2TASC	- \SRC\FAF2TASC	\EXE\FAF2NEW.EXP	\OBJ\FAF2TASC
GRIDEDIT	- \SRC\GRIDEDIT	\EXE\GRIDEDIT.EXP	\OBJ\GRIDEDIT
FINEGRID	- \SRC\FINEGRID	\EXE\FINEGRID.EXP	\OBJ\FINEGRID
FAFNIR	- \SRC\FAFNIR.NEW	\EXE\INTEL.EXP, WEITEK.EXP	

Object files for FAFNIR reside in

\OBJ\PHARLAP\FAFNIR.NEW\INTEL	- Intel coprocessor version
\OBJ\PHARLAP\FAFNIR.NEW\WEITEK	- Weitek coprocessor version

Rebuild Tools

Each source directory contains the following command-files:

C.BAT	- compiles a single source module
COMPILE.BAT	- compiles every source module by making repeated calls to C.BAT
XXX.LNK	- PharLap 386 linker command file. XXX is the name of the program (FINEGRID, CFINAL etc.)
L.BAT	- Invokes the PharLap 386 linker

Rebuild Tools for FAFNIR

The tools to rebuild FAFNIR are slightly different. The \SRC\FAFNIR.NEW directory contains the following command-files:

CI.BAT - compiles a single source module for the Intel (80387) co-processor
CW.BAT - compiles a single module for the Weitek coprocessor
CIALL.BAT - compiles all modules for the Intel coprocessor, by making repeated calls to CI.BAT
CWALL.BAT - compiles all modules for the Intel coprocessor, by making repeated calls to CI.BAT
INTEL.LNK - linker command-file for the Intel version
WEITEK.LNK - linker command-file for the Weitek version
LI.BAT - invokes the links the Intel version
LW.BAT - links the Weitek version

Rebuild Procedures

To rebuild AXCONV, CFINAL, FAF2TASC, FINEGRID, and GRIDEDIT:

1. Go into the appropriate source directory
2. Type **C <module-name>** to re-compile a single module or **COMPILE** to re-compile every module
3. Type **L** to re-link

To rebuild the Intel version of FAFNIR:

1. CD \SRC\FAFNIR.NEW
2. Type **CI <module-name>** to re-compile a single module or **CIALL** to re-compile every module
3. Type **LI** to re-link

To rebuild the Weitek version of FAFNIR:

1. CD \SRC\FAFNIR.NEW
2. Type **CW <module-name>** to re-compile a single module or **CWALL** to re-compile every module
3. Type **LW** to re-link

AXCONV

Creates Axum-compatible .DSF files from the new, variable-dimension final state files. The parameters are chosen intercatively.

CFINAL

Converts 51x37 FINAL.OUT files to the new, variable-dimension format. The new version of PC-FLAME requires the variable-dimension format. The variable-dimension final state files are called FINAL1.OUT and INIT1.OUT.

The module \SRC\CFINAL\PARAMIO.F contains a detailed description of the new format. The 1st record in the new final state file format, is a version number. This will allow PC-FLAME to read final state files even if the format is changed later on.

FAFNIR

1. The maximum size of the grids can be changed by editing the files GRID.CMN and/or ANGRID.CMN
2. The final state file format has been changed to the new variable-dimension format.
3. Furnace geometry can be specified using the new vertex-list method, in addition to the old restricted method.
4. Format of MODPAR3.DAT changed. See the Appendix for a complete listing. \SRC\FAFNIR.NEW contains a sample copy of MODPAR3.DAT

New source files:

ANGRID.CMN	- angular grid dimensions
GRID.CMN	- rectangular grid dimensions
FLEXGEOM.CMN	- variables for vertext-list based geometry
IJLIM.F	- computes ISTART() and JLIM() when the vertex list method is used to specify the geometry
PARAMIO.F	- reads/writes variable-dimension final state files
SKIPTO.F	- keyword-based read routines, to read the geometry sections of MODPAR3.DAT

Every source file which initialized the parameters NX, NY, NN1 or LD, LDP1, MD, MDP1 was changed. **include grid.cmn** and/or **include angrid.cmn** statements were added to such files.

The following modules were changed significantly: read_arr.f, writ_arr.f, readpar1.f, readpar2.f, echo.f

Minor changes were made to plot.cmn, checkinp.f, and blkdat.f

FAF2TASC

Extracts PC-FLAME parameters from new variable-dimension state files, and converts them to .RSF and .GRD files, which are readable by TASCPOST. See the file \SRC\FAF2TASC\README.DOC for more details.

FINEGRID

This program interpolates PC-FLAME parameters from an old coarse-grid, to a new, finer grid. The coarse grid, and the old parameters are read from a final state file. The new, finer grid is read from an Input Parameter (MODPAR3.DAT) file. FINEINFO.OUT contains some diagnostic information.

GRIDEDIT

Constructs a grid for an arbitrary geometry. GRIDINFO.OUT contains detailed diagnostics about the new grid.

GRIDEDIT can save the new grid and the new geometry in a PC-FLAME Input Parameter File (MODPAR3.DAT).

Unless the user exits through the S (save) option, the state of the Grid Editor is saved automatically in a binary file called DDMMHHMM.GRD, where DD-current day, MM-1st 2 letters of the current month, HH,MM-current hour and minute.

The axial grid is generated first. The spacing of the axial grid-lines follows the specified expansion-factors, even for grid-lines which are adjacent to vertices.

The radial-grid is generated after the axial grid. Hence, the radial grid is less perfect. The spacing of radial grid-lines which are adjacent to quarl-vertices do not in general conform to the specified expansion because they are restricted by the axial grid.

Two quarls must be separated by at least one vertical segment.

GRIDEDIT uses the following formula to estimate the amount of memory which will be required to run PC-FLAME with the newly generated grid: (NX*NY*950 bytes + 290000 bytes), this is an over-estimation.

Appendix PC-FLAME Input Parameter File (new format)

```
+------------------------------------------------------------ PC-FLAME ------+
!                      PC-FLAME Input Parameter File                         !
+--------------------------------------------------------------------------+
C1    File format last modified on March 1 1992 as follows:
C2
C3    1.  XYGRID (grid-type) parameter removed
C4    2.  Final Plot Data Generation Section removed
C5    3.  AUTGRID Parameter Section Removed
C6    4.  VARGEOM  (furnace geometry specification method) switch added
C7    5.  Variable Grid Specification Section added. This section can
C8        be left blank. The title lines for this section must still be present.
C9
+------------------------------------------------------------ PC-FLAME ------+
!                     Fundamental Parameters                                 !
+--------------------------------------------------------------------------+
100                 MAXIT   number of iterations in the current run
51                  NI      axial dimension of the simulation grid
37                  NJ      radial dimension of the simulation grid
12                  IMON    axial index of monitoring location
12                  JMON    radial index of monitoring location
2                   NINL    number of inlets (max. 10)
6                   NTH     number of polar directions for angular grid
4                   NFI     number of azimuthal directions for ang grid
3.00E-3             SORMAX  maximum sum of sources
+------------------------------------------------------------ PC-FLAME ------+
!                     I/O Control                                            !
+--------------------------------------------------------------------------+
F                   VARGEOM T-use var.geometry specs, F-use fixed geom. specs
T                   IREAD   T - read initial field data, F - start at iteration 1
F                   IWRITE  T-full output at MAXIT, F-reduced outp on nonconverg.
F                   IWSORC  print all sources of partic. phase given to gas phase
2                   IPRESD  print the residuals every this many iterations
T                   INCALC  T-run FAFNIR,  F-just print INIT.DAT
F                   INOUT   print the initial field
T                   ECHO    echo the input parameters in a file called ECHO.OUT
3000                PHFREQ full particle histories every this many iterations
1 2 3 4 5 6 7 8 9 10<--- Starting location indecies (columns)
F F F T F F F F F F 1
T T T T F F F F F F 2
F F F F F F F F F F 3       +-----------------------------------------+
T F F F F F F F F F 4       ! PPHIST - Particle history output matrix !
F F F F F F F F F F 5       +-----------------------------------------+
F F F F F F F F F F 6
F F F F F F F F F F 7     PPHIST(i,j) - TRUE means full output for particle
F F F F F F F F F F 8                   size i at starting location j.
F F F F F F F F F F 9
F F F F F F F F F F 10<--- Particle size indecies (rows)
+------------------------------------------------------------ PC-FLAME ------+
!                          Entrance Profile                                  !
+--------------------------------------------------------------------------+
2                   UPROF   1 - uniform, 2 - explicit, 3 - mass flow
2                   VPROF   1 - uniform, 2 - explicit
2                   WPROF   1 - uniform, 2-explicit, 3-swirl number,4-swirl angle
2                   TKEPROF (Turb.K.E.)   1 - default, 2 - explicit
2                   DISPROF (Dissipation) 1 - default, 2 - explicit
+------------------------------------------------------------ PC-FLAME ------+
!              Plot data generation for convergence monitoring               !
+--------------------------------------------------------------------------+
F                   Generate convergence-test plot data
2                   Generate convergence-test plot data every this many iteratns.
12                  X1 axial grid-coordinate of convergence-test point #1
12                  Y1 radial grid-coordinate of convergence-test point #1
1                   X2 axial grid-coordinate of convergence-test point #2
19                  Y2 radial grid-coordinate of convergence-test point #2
+------------------------------------------------------------ PC-FLAME ------+
```

```
!              Parameters To Control Convergence                              !
+-----------------------------------------------------------------------------+
3                   NSWPU   # of sweeps for U
3                   NSWPV             "       V
2                   NSWPW             "       W
1                   NSWPP             "       P
2                   NSWPK             "       K
2                   NSWPD             "       D
5                   NSWPX             "       X
2                   NSWPH             "       H
2                   NSWPVO            "       VO
2                   NSWPPR            "       PR
5                   NSWPRA            "       RA
35                  MAXSWP # of sweeps for P if PISO is used and NSWPP=1
0.20                RESP   sweep until residual ratio < RESP or MAXSWP is reached
1                   MAXSRA # of sweeps for the intensity loop
0.02                RESRA  sweep until change in wall radiant flux < RESRA
0.65                URFU   under relaxation factor for U
0.65                URFV                "                 V
0.60                URFW                "                 W
1.0                 URFP                "                 P
0.5                 URFK                "                 K
0.5                 URFE                "                 E
1.0                 URFVIS              "               VIS
0.5                 URFX                "                 X
0.5                 URFVOL              "               VOL
0.2                 URFDEN              "               DEN
0.5                 URFH                "                 H
0.5                 URFPR               "                PR
0.5                 URFTEM              "               TEM
0.50                URFRAD              "               RAD
0.05                URTRAK              "       particle tracking [New Jul '91]
+------------------------------------------------------------ PC-FLAME ----+
!                     Computation Control Parameters                        !
+-----------------------------------------------------------------------------+
T                   INCALU Calculate u-velocity
T                   INCALV    "      v-velocity
T                   INCALW    "      w-velocity
T                   INCALP    "      pressure
T                   INCALK    "      turbulent kinetic energy
T                   INCALD    "      dissipation
T                   INCALH    "      enthalpy
T                   INCALT    "      temperature
F                   INCARD    "      radiation
T                   INCALX    "      oxygen
T                   INCAVO    "      volatile
T                   INCAPR    "      product
T                   INPRO  Enable the call to the properties routine
T                   IPISO  T-use PISO algorithm on Pressure eq. F-use SIMPLE alg.
F                   ISIMC  simult. devolatilisation and char combustion
T                   IQUICK Use the quick discretization scheme
T                   INCAIN Use the Finite Volume Method for radiation
1                   INFREQ Use the FV method every this many iteration
+-------------------------------------------------------- PC-FLAME --------+
!                   Coal Related Quantities                                 !
+-----------------------------------------------------------------------------+
1                   INLCOL coal inlet number
0.01403             COLFLO coal mass flow rate (kg/s)
1512.6              DENP0  initial coal density (kg/m**3)
0.2560              FRESC % of C in coal
0.4417              FVOLC % of volatiles if coal
0.0379              FHY    mass fraction of hydrogen in coal
0.0026              FSU    % of S in coal
0.0093              FN2    % of N2 in coal
0.1515              FOX    % of O2 in coal
0.0                 FH2O   mass fraction of H2O in coal
0.1010              FASH   % of ash in coal
328.10E+05          CALVAL calorific value of carbon (J/kg)
```

```
0.5038E+08          ACTEV  activation energy for devolatilisation (J/kmol)
0.5908E+04          FKSO   pre-expon. factor for devolatilisation (1/s)
0.854E+08           ACTEK  activation energy for char combustion (J/kmol)
1.301E-02           APFACT pre-expon. factor for char combustion (kg/m^2sPa)
6.279E+05           HVOLEP latent heat of volatile evaporation (J/kg)
4.0                 ACOMB
2.0                 BCOMB
+------------------------------------------------------------------ PC-FLAME ------+
!                 Particle Tracking Parameters                                     !
+--------------------------------------------------------------------------------+
T                   ITRACK enable the particle tracking routines
1                   INTRAK calculate particle tracking every this many iterations
1                   ITRAK1 starting iteration number for particle tracking
T                   ICOMB  enable particle combustion calculation
F                   NOSLIP disable the drag law effect in trajectory calculation
4                   NPS    # of particle sizes to be tracked (max = 10)
4.05E-05            PD(1)   particle diameter
5.90E-05            PD(2)
8.95E-05            PD(3)
13.7E-05            PD(4)
0.171               FRACT(1) fraction of particles in particle size
0.742               FRACT(2)
0.065               FRACT(3)
0.022               FRACT(4)
4                   NSL     # of particle starting locations (max = 10)
0.0100              YST(1)  distance of firing location of particle
0.0190              YST(2)  from center in m
0.0290              YST(3)
0.0380              YST(4)
24.51               UPST(1) particle start velocity in m/s
24.68               UPST(2)
18.89               UPST(3)
10.54               UPST(4)
+------------------------------------------------------------------ PC-FLAME -----+
!                  Fluid Properties                                               !
+--------------------------------------------------------------------------------+
3.6E-5              VISCOS  Laminar viscosity (Ns/m**2)
0.5                 SCHMDT  Schmidt number
0.9                 PRANDT  Prandtl number
0.09                CMU     Turbulence model constants *check*
1.0                 CT *check*
1.44                C1 *check*
1.92                C2 *check*
1.00                TURINT  Turbulent Intensity in inlet and initial turb. calc.
0.005               ALAMDA  Length scale for initial and inlet dissipation
0.23                OXIN(1) oxygen concentration at inlet #1 *NEW*
0.23                OXIN(2) oxygen concentration at inlet #2 *NEW*
0.0                 PREF    Pressure of reference (Pa)
300                 TREF    Temperature of reference (deg.K)
2                   IPREF   axial grid coordinate of the reference point
2                   JPREF   radial grid coordinate of the reference point
1.176               DENSIT  (kg/m^3)
0.4187              CAPPA   *NEW*
9.793               ELOG    *NEW*
0.5                 PRH     *NEW*
1.0                 PRTE    *NEW*
1.0                 PRED    *NEW*
0.7                 PRLAM   *NEW*
0.5                 ETWALL  Emmissivity (TOP)  [ New Jul '91 ]
0.8                 EOWALL  Emmissivity        [ New Jul '91 ]
1.0                 EWWALL  Emmissivity (WEST) [ New Jul '91 ]
0.5                 AKGCINIT  Gas absorption coefficient  [ New Jul '91 ]
+------------------------------------------------------------------ PC-FLAME -----+
!                  U Velocity Entrance Profile                                    !
+--------------------------------------------------------------------------------+
24.000              UINL(1) U velocity at inlet #1
5.000               UINL(2) U velocity at inlet #2
1.02397E-01         FLOINL(1) Mass flow at inlet #1 (kg/s)
```

```
5.1325E-02          FLOINL(2) Mass flow at inlet #2 (kg/s)
0.000               UIN(1) Explicit initial U velocity
22.9440             UIN(2)
24.0910             UIN(3)
24.9780             UIN(4)
24.1730             UIN(5)
19.6910             UIN(6)
14.4290             UIN(7)
10.793              UIN(8)
7.393               UIN(9)
4.360               UIN(10)
2.774               UIN(11)
5.415               UIN(12)
6.120               UIN(13)
-9999               End of explicit U-velocity data
+------------------------------------------------------------ PC-FLAME -----+
!                    V Velocity Entrance Profile                            !
+---------------------------------------------------------------------------+
3.5                 VINL(1) V velocity at inlet #1
0.000               VINL(2) V velocity at inlet #2
0.0                 VIN(1)  Explicit initial V velocity
0.00                VIN(2)
1.599               VIN(3)
2.072               VIN(4)
2.698               VIN(5)
3.137               VIN(6)
3.101               VIN(7)
2.657               VIN(8)
2.121               VIN(9)
0.952               VIN(10)
-0.5664             VIN(11)
-0.1325             VIN(12)
0.5348              VIN(13)
-9999               End of explicit V-velocity data
+------------------------------------------------------------ PC-FLAME -----+
!                    W Velocity Entrance Profile                            !
+---------------------------------------------------------------------------+
0.00                WINL(1) W velocity at inlet #1
4.00                WINL(2) W velocity at inlet #2
2                   INLSW   The number of the inlet with the swirl
0.70                SWNUMB  Swirl number at inlet INLSW
60.0                SWANGL  Swirl angle (in degrees) at inlet INLSW
0.0                 WIN(1) Explicit initial W velocity
0.0                 WIN(2)
0.0                 WIN(3)
0.0                 WIN(4)
0.0                 WIN(5)
0.0                 WIN(6)
0.0                 WIN(7)
0.0                 WIN(8)
0.227               WIN(9)
1.269               WIN(10)
2.982               WIN(11)
6.313               WIN(12)
6.023               WIN(13)
-9999               End of explicit W-velocity data
+------------------------------------------------------------ PC-FLAME ----+
!                 Turbulent Kinetic Energy Entrance Profile                 !
+---------------------------------------------------------------------------+
0.00000             TE(1,1)
1.97400             TE(1,2)
2.18600             TE(1,3)
2.35600             TE(1,4)
2.21900             TE(1,5)
1.49100             TE(1,6)
0.81700             TE(1,7)
0.46300             TE(1,8)
0.22200             TE(1,9)
```

```
0.08100             TE(1,10)
1.26800             TE(1,11)
5.19000             TE(1,12)
5.55100             TE(1,13)
-9999               End of Turbulent Kinetic Energy Entrance Profile data
+------------------------------------------------------------ PC-FLAME ----+
!                      Dissipation Entrance Profile                        !
+--------------------------------------------------------------------------+
0.00000             ED(1,1)
97.01000            ED(1,2)
113.0500            ED(1,3)
126.4900            ED(1,4)
115.6200            ED(1,5)
63.68000            ED(1,6)
25.83000            ED(1,7)
11.02000            ED(1,8)
3.66000             ED(1,9)
0.80600             ED(1,10)
166.8200            ED(1,11)
1381.4300           ED(1,12)
1528.0400           ED(1,13)
-9999               End of Dissipation Entrance Profile data
+------------------------------------------------------------ PC-FLAME ----+
!        Furnace Geometry Specifications Using The Fixed Grid Method       !
+--------------------------------------------------------------------------+
0.4925              RLARGE  radius of tunnel furnace in meters
5.37                ALTOT   total length of the calculation domain
2                   IINL    index of the inlet plane
1                   JINL(1) J Grid before start of inlet #1
10                  JINL(2) J Grid before O.D. of inlet #1
10                  JINL(3) J Grid before start of inlet #2
13                  JINL(4) J Grid before O.D. of inlet #2
Primary             INLNAM(1) name of inlet 1
Secondary           INLNAM(2) name of inlet 2
T                   IQUARL  T - a quarl exists
T                   IEXPAN  T - a step exists
32                  ISTEP   I index just before the wall (step) intersection
34                  JSTEP   J index just before the wall (step) intersection
15                  IQRL1   I index of quarl start
25                  IQRL2   I index of quarl end
15                  JQRL1   J index of quarl start
25                  JQRL2   J index of quarl end
29                  JOUT    location of the outlet wall (use NJ-1 if no outwall)
+------------------------------------------------------------ PC-FLAME ----+
!      Furnace Geometry Specifications Using The Variable Grid Method      !
+--------------------------------------------------------------------------+
0.4925              RLARGE  radius of tunnel furnace in meters
5.37                ALTOT   total length of the calculation domain
2                   IINL    index of the inlet plane
29                  JOUT    location of the outlet wall (use NJ-1 if no outwall)
3                   NREGION Number of regions
I                   RGION001 Type of region (H-horiz,V-vertic,Q-quarl,I-inlet)
0.0                 PHYSI001 I-coord of the end of region #001
0.1                 PHYSJ001 J-coord of the end of region #001
I                   RGION002 Type of region (H-horiz,V-vertic,Q-quarl,I-inlet)
0.0                 PHYSI002 I-coord of the end of region #002
0.2                 PHYSJ002 J-coord of the end of region #002
V                   RGION003 Type of region (H-horiz,V-vertic,Q-quarl,I-inlet)
0.0                 PHYSI003 I-coord of the end of region #003
0.05                PHYSJ003 J-coord of the end of region #003
+------------------------------------------------------------ PC-FLAME ----+
!                       Temperatures                                       !
+--------------------------------------------------------------------------+
362.86              TIN(1)  temperature at inlet #1
389.66              TIN(2)  temperature at inlet #2
1000.0              TAIR    initial air temperature (deg.K)
F                   INITT   initialize entire field temp. to the air temperature
T                   INTERWT use interpolation to compute TWALL(1)..TWALL(NI)
```

```
353.0     -0.1       Dummy
400.2     1.24       TWALL(1) / axial dist.for the 1st interpolation point *NEW*
400.7     1.39       TWALL(2) / axial dist.for the 2nd interpolation point *NEW*
398.7     1.54       TWALL(3)  Temperatures are in deg. K.
397.7     1.68       TWALL(4)
396.2     1.84       TWALL(5)
395.7     1.99
393.7     2.14
393.7     2.29
393.2     2.44
391.7     2.59
393.7     2.74
393.2     2.89
392.2     3.04
391.2     3.19
390.7     3.35
390.2     3.49
389.7     3.65
388.7     3.80
388.7     3.94
389.7     4.09
391.7     4.25
391.2     4.40
391.2     4.55
390.2     4.71
390.7     4.86
389.7     5.00
391.2     5.16
389.7     5.30
389.7     5.40
-9999               End of wall temperature data.
+------------------------------------------------------------- PC-FLAME ----+
!                   Adiabatic wall specifications                          !
+--------------------------------------------------------------------------+
1                   Start of the 1st adiabatic region
32                  End of the 1st adiabatic region
-9999                Start of the 2nd adiabatic region  [-9999 means that there
-9999                End of the 2nd adiabatic region     is no adiab. region ]
+------------------------------------------------------------- PC-FLAME ----+
!                              X-Y grid                                    !
+--------------------------------------------------------------------------+
-0.005               X(1)     Axial grid coordinates X(1),...,X(51)
0.005               X(2)
0.0160              X(3)
0.0280              X(4)
0.0410              X(5)
0.0550              X(6)
0.0700              X(7)
0.086               X(8)
0.103               X(9)
0.120               X(10)
0.1364              X(11)
0.1564              X(12)
0.1764              X(13)
0.1964              X(14)
0.2164              X(15)
0.2364              X(16)
0.2564              X(17)
0.2755              X(18)
0.2955              X(19)
0.3150              X(20)
0.3335              X(21)
0.3530              X(22)
0.369               X(23)
0.390               X(24)
0.4125              X(25)
0.4299              X(26)
0.530               X(27)
```

```
0.630               X(28)
0.73                X(29)
0.84                X(30)
0.96                X(31)
1.09                X(32)
1.21                X(33)
1.32                X(34)
1.43                X(35)
1.60                X(36)
1.85                X(37)
2.05                X(38)
2.30                X(39)
2.60                X(40)
2.90                X(41)
3.20                X(42)
3.50                X(43)
3.80                X(44)
4.10                X(45)
4.40                X(46)
4.65                X(47)
4.90                X(48)
5.10                X(49)
5.25                X(50)
5.40                X(51)
-0.002              Y(1)   Radial grid coordinates  Y(1),...,Y(37)
0.002               Y(2)
0.0070              Y(3)
0.014               Y(4)
0.021               Y(5)
0.0280              Y(6)
0.03372             Y(7)
0.03772             Y(8)
0.04172             Y(9)
0.04560             Y(10)
0.04970             Y(11)
0.0610              Y(12)
0.0717              Y(13)
0.0807              Y(14)
0.0877              Y(15)
0.0965              Y(16)
0.1061              Y(17)
0.1156              Y(18)
0.1249              Y(19)
0.1341              Y(20)
0.1433              Y(21)
0.1520              Y(22)
0.1600              Y(23)
0.1700              Y(24)
0.1803              Y(25)
0.1888              Y(26)
0.20                Y(27)
0.215               Y(28)
0.235               Y(29)
0.260               Y(30)
0.290               Y(31)
0.325               Y(32)
0.365               Y(33)
0.400               Y(34)
0.434               Y(35)
0.475               Y(36)
0.5093              Y(37)
+-------------------------------------------------------------------------------+
|                   End of the PC-FLAME Input Parameter File                    |
+-------------------------------------------------------------------------------+
```